**d. Remarks**

## AMENDMENTS

Amendments to each of claims 1, 4 – 5, 22 – 24, and 34 – 35 are, e.g., supported by the previously pending claim with the same number.

Amendments to claims 1, 22, and 34 clarify that recited steps for forming the body or tube are steps of the claimed processes.

The amendment to each of claims 1, 4 – 5, 22 – 24, and 34 – 35 clarifies that a recited treating step is performed in a recited temperature range of the claim without further requiring said treating step range over the whole recited temperature range. In particular, the treating steps of claim 1 and 22 are performed at temperatures in the range of 300°C to 900°C. In particular, the treating steps of claims 5, 24, and 35 are performed at temperatures in the range of 600°C to 700°C. In particular, the treating steps of claims 4, 23, and 34 are performed at temperatures in the range of 400°C to 800°C.

## RESPONSES TO REJECTIONS

**1. Claims 34-39, 41-42, and 44 are non-obvious over a combination of Bhandarkar (U.S. Patent 5,356,447) and Shintani (U.S. Patent 4,264,347).**

Bhandarkar teaches a method for removing refractory oxide particles in an unsintered porous sol-gel body. Bhandarkar abstract; col. 1, line 64-68; col. 2, lines 49-51; claim 1. In his method, a reactive gas reacts with the refractory oxide particles in the body to produce a <u>gaseous reaction product</u>. Id.; col. 4, lines 23-26. The gaseous reaction product flows out through pores in the unsintered body thereby removing the particles from the body. Id.; col. 4, lines 52-56. The ability to react with refractory oxides to produce a gaseous reaction product is central to the reactive gas used in Bhandarkar's method.

Bhandarkar discloses the use of thionyl chloride, i.e., $SOCl_2$, as the reactive component of the gas for removing the refractory oxide particles in the sol-gel body. With respect to the reactive gas, Bhandarkar states:

> It is likely that $SOCl_2$ will be preferred as the prime or sole chlorine-containing ingredient. $SOCl_2$, is more effective than molecular chlorine and, thus far,

appears unique. Explanation for effectiveness is likely related to presence of the moiety $SO^-$. ... Experimental findings strongly suggest that particle removal may be due to $SO^-$ to an equal or greater part than to released chlorine. Related halogen-containing compounds may serve to remove the refractory particles. Experimentation thus far has not identified anything of effectiveness equal to that of $SOCl_2$. Materials considered include $SOF_2$, $S_2OCl_4$, $S_2O_3Cl_4$, $SOBr_2$, $PCl_5$, $PCl_3$, and $BCl_3$. Some of these, e.g. the B- and P-containing compounds may dope the silica glass to result in unwanted change in refractive index.

Bhandarkar, col. 3, line 64, to col. 4, line 13.

Thus, Bhandarkar teaches that gases as effective as $SOCl_2$ have not been identified. He further suggests that $SOCl_2$ may be unique in being more effective than molecular chlorine. He also strongly suggests that the effectiveness of $SOCl_2$ is likely due to its $SO^-$ moiety. Though Bhandarkar does explicitly list three compounds with no $SO^-$ moiety, i.e., $PCl_5$, $PCl_3$, and $BCl_3$, he also teaches that use of such "B- and P-containing compounds" may produce unwanted doping-induced changes in silica glass. Thus, Bhandarkar teaches against the only compounds that he lists as not having $SO^-$ moieties. While Bhandarkar lists other potential reactive gases in addition to $SOCl_2$, i.e., $SOF_2$, $SOBr_2$, $S_2OCl_4$, $S_2O_3Cl_4$, each of these gases has a $SO^-$ moiety like $SOCl_2$.

Shintani teaches a method of fabricating optical fiber preforms that involves performing surface treatments to remove imperfections at surfaces. Shintani, abstract. Shintani states that "the surface treatment produces a satisfactory interface free from defects such as voids...." and that "some kinds of the surface treating agents also clean up ... surface layers". Shintani, col. 5, lines 46-65. Shintani does describe "glass surface treating agents" that include non-oxygenated sulfur halides. Shintani, col. 7, lines 16-43. Shintani's methods involve using the surface treating agents to produce reaction products that incorporate into the glass surface being treated. Shintani, col. 5, lines 46-col. 6, line 3. This should be contrasted with Bhandarkar's method, which is based on a reactive agent that produces a gaseous reaction product.

Even if pending claim 34 is only a modification of the method of Bhandarkar wherein Bhandarkar's reactive gas is replaced by a gas described by Shintani, that would not of itself be sufficient to show obviousness. Showing obviousness would also require a specific prior art suggestion to modify Bhandarkar or a specific prior art suggestion to combine Bhandarkar with Shintani to produce the invention-at-issue. See e.g., In re Fine, 837 F.2d 1071, 1075, 5 U.S.P.Q.2d 1596, 1599-60 (Fed. Cir. 1988); see also, In re Sang

Su Le, 277 F.3d 1338, 1342-3, 61 U.S.P.Q.2d 1430 (Fed. Cir. 2002). The requirement of a specific prior art suggestion to modify or combine is essential to the prima facie obviousness case.

The Examiner has not provided a prior art suggestion sufficient to have motivated such a modification of Bhandarkar's method.

Bhandarkar does not suggest either a problem or an advantage that would have motivated modifying his method. Bhandarkar does not state that there is a problem with using $SOCl_2$, i.e., a problem that would motivate a substitution of $SOCl_2$ by a non-oxygenated sulfur halide as recited in the claim 34. Instead, Bhandarkar suggests that $SOCl_2$ has preferred properties and possibly optimal properties as the reactive gas in his method. Bhandarkar, col. 3, line 64, to col. 4, line 13. Such teachings would not have motivated one of skill in the art to modify Bhandarkar's method and thereby arrive at the claimed inventions.

Similarly, even though Shintani teaches uses of non-oxygenated sulfur halides, i.e., reactive gases of the claims at issue, Shintani does not motivate the use of non-oxygenated sulfur halides in Bhandarkar's method. Shintani uses non-oxygenated sulfur to treat glass surfaces. Shintani, abstract. Such uses are irrelevant to gas removal of refractory oxide particles from inside a porous unsintered body, i.e., the goal of Bhandarkar.

Also, Shintani neither discusses the removal of refractory oxide particles nor suggests that his surface treating agents even react with the refractory oxides. For that reason, Shintani does not motivate using his surface treating agents in Bhandarkar's method for removing such refractory oxides.

Furthermore, Shintani does not suggest that his surface treatment agents produce gaseous reaction products as needed for any reactive gas in Bhandarkar's "gas removal" method. Instead, Shintani teaches that his surface treatment agents produce reaction products that incorporate into the glass surface. Shintani, col. 5, lines 46-col. 6, line 3.

For the above reasons, the teachings of Shintani would not have motivated the use of his surface treatment agents, e.g., non-oxygenated sulfur halides, in the method of Bhandarkar.

For the above reasons, neither Shintani nor Bhandarkar would have motivated one of skill in the art to modify Bhandarkar to produce the method of pending claims 34. The Examiner has not provided other suggestions from other prior art that would have been sufficient to motivate modifying Bhandarkar as required in the prima facie case of obviousness of claim 34.

At pages 2 – 3 of the Office Action, the Office Action lists several independent grounds for his assertion that the modification of Bhandarkar's method to use a gas of Shintani is obvious. Below, each of the grounds is separately rebutted.

First, the Office Action states:

> Instead, Bhandarkar discloses that some routine experimentation was performed to determine the preferred gas of eight gases considered (col. 4, line 8). It would have been obvious to perform additional routine experimentation to determine what the best gas is.

Office Action, page 2, last par.

The above statement is a conclusion rather than evidence of a prior art suggestion to modify Bhandarkar. An obviousness rejection needs evidence of a prior art suggestion of the desirability of modifying Bhandarkar, e.g., a teaching of a specific problem in Bhandarkar's method. In re Sutherland, 733 F.2d 900, 902, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984). The mere fact that the prior art could have been modified is not relevant. In the absence of a suggestion of the desirability of a modification, arguing that further experimentation would have been obvious, is nothing but an "obvious to try" argument. Obvious to try arguments are improper grounds for obviousness rejections. See e.g., In re Goodwin, 576 F. 2d 375, 377, 198 U.S.P.Q. 1 (CCPA 1978); In re Fine, 837 F.2d 1071, 1075, 5 U.S.P.Q.2d 1596, 1599 (Fed. Cir. 1988).

Bhandarkar's experiments to find a reactive gas do not of themselves provide a suggestion for modifying his methods. Experiments of themselves do not motivate further experiments. In fact, Bhandarkar states that experiment findings strongly suggest that particle removal is to a large part due to a $SO^-$ moiety of a reactive gas. Bhandarkar, col. 3, line 64, to col. 4, line 13. Bhandarkar does not suggest any problem with gases with the $SO^-$ moiety. Instead, he states that $SOCl_2$ is likely preferred as the reactive gas of his method. Id. Bhandarkar only implies that he arrived at the preferred reactive gas

through experimentation and not that further experimentation to find another gas would be desirable.

Next, the Office Action states that:

> At col. 7, lines 16-43, col. 2, lines [sic] 28 Shintani teaches which gases can be used to remove impurities from silica fiber preforms."

Office Action, page 2, last par.

This statement misrepresents the cited sections of Shintani. At col. 2, lines 24-30, Shintani states that <u>oxygen gas</u> has been proposed to remove foreign matter, i.e., impurities, rather than a <u>non-oxygenated sulfur halide</u> as recited in pending claim 34. At col. 7, lines 16-43, Shintani states that the listed compounds are "surface treating agents" rather than as agents for removing "impurities" inside a porous silica preform.

Furthermore, the properties that Shintani teaches for surface treating agents are not of themselves relevant to Bhandarkar's method for gaseous removal of refractive oxide particles. In particular, Shintani nowhere suggests his surface treating agents even react with refractory oxides as required for the reactive gas of Bhandarkar's method. Also, Shintani suggests uses of surface treating agents to produce a substance that incorporates into the surface glass rather than to produce a <u>gaseous reaction product</u> as required in Bhandarkar's <u>gas removal</u> method. See e.g., Shintani, col. 5, lines 46-55, col. 6, lines 39-45. For these reasons, Applicants respectfully disagree with the Examiner's statement that <u>Shintani teaches which gases</u> may be used in Bhandarkar's process.

Next, the Office Action states that:

> And/or [it] would have been obvious to use any of the Shintani gases for the Bhandarkar gases because it is the <u>mere substitution</u> of one known cleaning gas for another.

Office Action, page 2, before last line, to page 3, line 1. (underlining added).

An obviousness rejection requires more than a showing that the invention follows from a mere substitution of an element A of a prior art device or process by another known element B. To find obviousness based on such a mere substitution argument, the substitution must involve elements A and B that were <u>known prior art equivalents</u>. See e.g., M.P.E.P. § 2144.06; <u>In re Ruff</u>, 256 F.2d 590, 596-7, 118 U.S.P.Q. 340, 346 (CCPA 1958). The prior art must recognize that the replacing new element B and the replaced old element A were able to provide the same relevant function, i.e., the function in the

prior art device or method. Without a prior recognition that the two elements could perform the same relevant function, the mere fact that the invention follows by substitution does not imply obviousness.

The Examiner states that an obvious invention follows from the substitution of a Shintani gas for a gas in Bhandarkar's method, because both Shintani's and Bhandarkar's gases were "known cleaning gases". Even if Shintani's and Bhandarkar's gases were both broadly recognized in the prior art as cleaning gases, that fact would not establish the known equivalency of these two gases with respect to Bhandarkar's method. Being a "cleaning gas" is not the relevant function to Bhandarkar's method. The relevant function for Bhandarkar's reactive gas is the ability to <u>react with refractory oxides</u> inside a body and to produce a <u>gaseous reaction product</u> that can diffuse out through pores in the body. See Bhandarkar, col. 3, lines 22-23; col. 4, lines 19-27; claim 1. Liberation of the gaseous reaction product effectively removes the refractory particles from the porous body during Bhandarkar's process. See previously filed Sec. 1.132 Declaration of Mandich and Reents, executed April 22, 2002, par. 5. The Examiner provides no evidence that Shintani's gases were recognized in the prior art to have any such abilities. Furthermore, Shintani does not suggest that non-oxygenated sulfur halides even react with refractory oxides. Shintani also does not teach that his surface treating agents react to form a gaseous product. Shintani, col. 6, lines 39-45. Lack of a prior art teaching that Shintani's gases were capable of the function relevant to Bhandarkar's method makes mere substitution an improper grounds for an obviousness rejection.

The Office Action also states:

> Further it is noted that the claim [sic] gas is a <u>homomorph</u> of the Bhandarkar preferred gas – it just has one substituted Group VIB atom (sulfur) for another Group VIB atom (oxygen).

Office Action, page 3, lines 1 – 3. (underlining added)

Applicants assume that the Examiner is referring to the fact that substitution of a sulfur atom for an oxygen atom in Bhandarkar's reactive gas, $SOCl_2$, produces $S_2Cl_2$. $S_2Cl_2$ is a gas within the scope of the non-oxygenated sulfur halides recited in claims at issue herein.

In chemistry, homomorph is generally defined as;

> Homomorphs [chem.] Chemical molecules that are similar in size and shape, but not necessarily having other characteristics in common.

McGraw-Hill Dictionary of Science and Technical Terms, pages 761. (previously submitted)

Substitution of a "homomorph" for a chemical compound in a prior art process is not grounds for an obviousness rejection. Substitution of a homomorph involves replacing one chemical compound by another compound whose molecules have similar "size and shape" rather than replacing the chemical compound by a compound with a similar chemical reactivity. The chemical reactivities rather than the molecular "sizes and shapes" are the relevant characteristics for the reactive gas of Bhandarkar's method.

Applicants know of no legal precedent for an obviousness rejection based on the grounds of "substitution of a chemical <u>homomorph</u>". Applicants have requested that the Examiner either supply legal precedent for this rejection or withdraw the rejection, but received no response.

Applicants remark that $SOCl_2$ and $S_2Cl_2$ are not chemical "homologs".

The Office Action also states:

> Further, col. 4, lines 19-26 spell out what one needs for a reactant.

Office Action, page 3, line 3.

The text from col. 4, lines 19-26 of Bhandarkar simply lists properties of the reactive gas of his method. It states that the properties include the ability to disassociate and cause disassociation of particulate refractive oxides and the ability to produce a gaseous reaction product. This teaching does not make obvious a substitution of non-oxygenated sulfur halides for the reactive gas of Bhandarkar's method in the absence of a prior art teaching that non-oxygenated sulfur halides react with refractory metal oxides and produce gaseous reaction products.

The Office Action also states:

> It is argued there is no prior art suggestion to use the Shintani treating agent. The motivation is to find the best treating agent. Bhandarkar discloses the agent choice is important and leaves open the possibility of better agents.

Office Action, page 7, lines 1 – 3.

"Leaving open the possibility of other gases" is not of itself a motivation to search for other gases, at least, in the absence of a statement of some problem or drawback with the

known gases. In light of the following, Bhandarkar clearly does not suggest such problems or drawbacks that would have motivated a search for a replacement to his $SOCl_2$,:

> It is likely that <u>$SOCl_2$ will be preferred</u> as the prime or sole chlorine-containing ingredient. $SOCl_2$, is more effective than molecular chlorine <u>and, thus far, appears unique</u>. Explanation for effectiveness is <u>likely related to the presence of the moiety $SO^-$</u>. ...

Bhandarkar, col. 3, lines 64 -68. (underlining added)

The above statement by Bhandarkar would have motivated one of skill in the art to not attempt to modify Bhandarkar's method by replacing $SOCl_2$ with a "non-oxygenated" compound as recited in the pending claims.

Applicants also emphasize that the Federal Circuit has said that, "[e]vidence that supports, rather than negates, patentability must be fairly considered." In re Dow Chemical, 837 F.2d 469, 473, 5 U.S.P.Q.2d 1529, 1531-32 (Fed. Cir. 1988). The above prior art teaching must be considered for its suggestion of the advantageous and unique role of $SOCl_2$ and gases with $SO^-$ moieties. Methods that use such gases are not recited in the claims at issue, i.e., gases with $SO^-$ moieties are not non-oxygenated sulfur halides. These teachings provide evidence supporting the non-obviousness of the claims at issue over Bhandarkar when modified by Shintani. This evidence must be considered in deciding whether the claimed method is obvious.

Applicants believe that it has been persuasively argued that the Examiner has not provided a specific prior art suggestion for modifying Bhandarkar's method, at least, in a manner that would motivate the invention. In particular, Bhandarkar states, at least, that $SOCl_2$ may be the preferred reactive gas for his method. Bhandarkar further states that the $SO^-$ moiety appears important to the advantageous properties of $SOCl_2$. The fact that Bhandarkar arrived at these conclusions by experimentation does not motivate the search for other reactive gases. This is especially true since Bhandarkar makes no statements about disadvantageous or undesirable properties of using $SOCl_2$ in his method.

**2. Claims 34-39, 41, and 44 are rejected as obvious over a combination of Bhandarkar, Kanamori, and Chandross.**

In response to a suggestion of the Examiner, at page 7, lines 13 – 15, claim 34 has been amended to recite:

> heating the entire gelled tube to a temperature <u>in the range of</u> 400 to 800°C and, <u>while</u> the gelled tube is <u>at the temperature, treating</u> the gelled tube with a gaseous ....

(underlining added)

Even if Kanamori suggests a $S_2Cl_2$ treatment step, Kanamori teaches performing the treatment step at a temperature between 900°C – 1100°C. Such high temperatures are outside of the range of 400°C – 800°C recited for the treatment step in amended claim 34. Thus, Kanamori teaches against performing a treatment step as recited in amended claim 34. For that reason, an obvious rejection should not be based on Kanamori.

Kanamori does not suggest that a temperature of less than 900°C could be appropriate for his dewatering treatment. Instead, he teaches using a higher temperature range of 900-1100°C, which is outside of the range of claim 34. At the sentence between pages 4 and 5, the Examiner is substituting his own temperature range for a clear teaching of an inconsistent temperature by Kanamori. This is impermissible hindsight.

On page 3, lines 9 – 15, the Office Action also proposes combining Kanamori with Chandross to obtain the recited range. As motivation to modify Kanamori, the Office Action states:

> One of ordinary skill realizes that higher temperatures are more expensive than lower temperatures – see feature 13a) [sic] of the table. It would have been obvious to do the dehydrating at the lower end of the preferred temperature range (i.e. near 500 C) to reduce the power costs for the process.

Office Action, page 4, lines 11 – 15.

Applicants request evidence that dehydrations performed at 900C and above are more expensive than dehydrations in the claimed range of 400C to 800C and this was known in the prior art. The above citation to Chandross provides no evidence that lower temperature dehydrations with non-oxygenated sulfur halides are less expensive than a <u>dehydration</u> at 900-1100C as taught by Kanamori. At cols. 11 – 12, entry 12a, Chandross doesn't even suggest a dehydration that is based on the non-oxygenated sulfur halide of Kanamori. Instead, the cited portion of Chandross's table discloses a dehydration based on $Cl_2$ and $O_2$. The above citation does not provide an adequate motivation to modify Kanamori's temperature range.

As a motivation to modify Bhandarkar by replacing a chemical agent therein with $S_2Cl_2$ as taught by Kanamori, the Office Action states:

> Kanamori discloses that it is preferred to use $S_2CL_2$ to dehydrate porous glass. See the English Translation of Kanamori, page 7, line 16 and 27; page 6, lines 3-8; the sentence spanning pages 6-7;

Office Action, page 4, lines 3 – 5.

At page 7, lines 16, the English Translation of Kanamori actually states "It is preferred that $SOCl_2$ or $S_2CL_2$ be used." Thus, the citation from Kanamori does not motivate a modification to replace "oxygenated" $SOCl_2$ with something else.

Also, Kanamori is non-analogous art to Bhandarkar's problem of removing refractory particles from sol-gel preforms. In particular, Kanamori teaches a method of making silica glass base material for optical cores by the VAD method. See English Translation of Kanamori, page 4, 1st paragraph and page 7, lines 1-4. The gases used in the VAD process were known in the art to be of such high purity that substantially no refractory metal oxide particles exist in glass bodies formed by VAD. See previously filed Section 1.132 Declaration of Mandich and Reents, executed Dec. 9, 1999. For that reason, one of skill in the art would not have considered Kanamori's methods in searching for ways to modify or improve Bhandarkar's method for removing refractory metal oxide particles.

**3. At pages 5 – 6, the Office Action rejects claims 34 – 35, 37 – 39, and 44 as obvious over a combination of Shintani, Chandross, and any prior art admissions page 3 at the present specification.**

Claim 34 recites "heating the entire gelled tube to a temperature in the range of 400 to 800°C, <u>while … at the temperature</u>, <u>treating</u> the gelled tube <u>with</u> a gaseous mixture comprising one or more <u>non-oxygenated sulfur halides</u>". The above rejection does not cite a prior art teaching for each of the above-recited features of amended claim 34. In particular, no teaching is provided for performing the treating step while the temperature is in the range of 400 to 800°C. For that reason, this rejection has not established a prima facie case of obviousness and should be withdrawn.

**4. Rejections of dependent claims**

Dependent claims 35 – 39, 41 – 42, and 44 are non-obvious at least by their dependence on non-obvious independent claim 34.

## 5. Conclusion

For the above reasons, Applicants respectfully request allowance of claims 1 – 10, 12 – 25, 28 – 39, 41 – 42, and 44 as presently pending.

No fee is believed due.

In the event of any non-payment or improper payment of a required fee, the Commissioner is authorized to charge or to credit **Lucent Technologies Deposit Account No. 12-2325** to correct the error.

Respectfully,

John McCabe

John F. McCabe, Reg. No. 42,854
Telephone: 908-582-6866

Date: Nov. 12, 2003

Lucent Technologies Inc.
Docket Administrator, Rm. 3J-219
101 Crawfords Corner Road
Holmdel, New Jersey 07733